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- USSR -

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SOME MEDICINAL PLANTS USED IN CHINESE MEDICINE

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Chinese medicine is of great interest as a rich source for new therapeutic preparations. Developed over the course of thousands of years, it now counts approximately 2,000 different drugs of which two thirds are of vegetable origin.

Among the medicinal plants of Chinese medicine we should distinguish: 1) pharmacopoeial plants; this is a comparatively small number of 66 species from which drugs of the so-called European medicine are prepared; 2) plants used for therapeutic purposes in popular medicine at the present time and not considered official; 3) plants of Old Chinese medicine; this is the most numerous group, counting up to 1,500 species and recognized as official in China at present. Drugs from these plants were tested by the Chinese people and physicians of antiquity during the course of thousands of years and have been given their most brilliant presentation in the works of the outstanding pharmacologist and botanist Li Shih-cheng. In his book Principles of Pharmacology (Peng Ts'ao Kang Mu), published in 1578 and numbering 52 volumes, Li Shih-cheng gave a critical survey and generalization of the very rich experience gained by the Chinese people and physicians during their past history up to the 16th century. In this major work we have detailed descriptions of 1,892 drugs of predominantly vegetable origin, more than 1,000 prescriptions, the names and a detailed description of each therapeutic substance or plant, methods for harvesting, distinctive properties and the action of the drugs on the body. The remarkable work of Li Shih-cheng had a profound influence on the theory of pharmacology and botany, on the practical use of drugs in Chinese medicine and has not lost its scientific value even in our day. It has been translated or transcribed into Japanese, Latin, Russian, German, English and French and is widely used in modern Chinese editions, for example in the work of Professor P'ei Medicinal Plants of China.

In this connection we can understand why the Old Chinese classical medicine, rightfully called Chinese popular medicine, could be declared official for the country.

Despite such a long testing period, modern Chinese scientists believe that the remedies of Chinese popular medicine are not all effective to the same degree. For this reason in many of the major cities institutes of popular medicine have been organized, large research institutions set up to study popular drugs through all the means of modern medical science.

Chinese popular drugs present a certain complexity for study in that they consist of many components of vegetable, and partially animal and mineral origin. The study of such complex formulae is carried on in different ways: 1) examining a complex of formulae as such and selecting the best of them; 2) reexamining the components of the formula and eliminating those which have turned out to be but little effective or simple inert ingredients; 3) by individual study of the components which play the main therapeutic role in the prescription; 4) by a combined use of the agents of modern and popular medicine.

Despite the fact that a planned over-all study of the drugs of Chinese popular medicine started almost 3 years ago, each of these ways has already given positive results. For instance, in treating diabetes mellitus the best was found to be the simple prescription Hsiang Ti Huang, consisting of the following plants: *Panax ginseng* C.A.M., *Lycium chinense* Mill., *Cornus officinalis* Sieb. et Zucc., *Rehmannia glutinosa* (Gaertn.) Libosch., *Asparagus lucidus* Lindl. In nephritis successful use is made of Liung Ti Huang, consisting of *Paeonia suffruticosa* Andr., *Alisma plantag-aquatica* L., *Dioscorea batatas* Decne., *Rehmannia glutinosa* (Gaertn.) Libosch., *Rachyma cocos* Fr. and *Cornus officinalis* Sieb. et Zucc.

Hypertension in women during the climacteric has been successfully treated with Ar Hsien T'ian of the following composition: *Curculigo orchoides* Gaertn., *Epimedium sagittatum* Baker, *Bacopa monnieri* (L.) Wettst., *Phellodendron amurense* Rupr., *Anemarrhena asphodeloides* Bunge, *Ligusticum sinense* Oliv.

As yet, in mentioning such examples of the best formulae, we must say that not a single Chinese popular physician of the older generation treats a disease with a single drug. The prescriptions of popular physicians are sometimes very complex (up to 150 components), extremely variable, are prescribed for 3 - 7 - 14 days each depending on the condition of the patient, sex, age, time of the year, etc. A study of all these details and nuances is a matter for the future but already the joint work of popular and modern Chinese physicians is contributing to the adoption of methods of Chinese popular medicine.

As an example of combined therapy with drugs from modern and Chinese popular medicine we might cite the use of ginseng as a factor which intensifies the action of insulin in diabetes or *Conioselinum* with reserpine in treating hypertension.

The greatest progress has been made in the field of individual study of medicinal plants. Possibilities here are almost limitless. The 30,000 species of plants which occur in the temperate, subtropical and tropical zones provide a very rich and diversified supply for seeking out new species of medicinal plants. Botanical institutes and gardens, pharmaceutical and medical institutes of teaching and research, by making use of the rich experience of Chinese popular medicine and the principle of phylogenetic kinship have plunged actively into the study of the medicinal flora of China. As a result plants have already been discovered which are promising for treating various diseases.

Plants Used in Treating Hypertension

Lo Fu Mu (*Rauwolfia verticillata* Baill. = *R. Chinensis* Hemsl.), a bare shrub about one meter in height of the dogbane family. Occurs in the southern provinces of China in small mountain forests, in swamps and in sites protected from the sun. Blooms from April to July, bears fruit from August to October. A species, widely variable in the general appearance of plants, consisting probably of several geographical races. Alkaloids contained in all parts of the plant but most of all in the roots (0.68 - 1.2%) and in the bark of the roots (up to 1.5%). Reserpine content very low, not more than 0.02%. Galenicals from the different parts of the plant and alkaloids from the bark of the roots have a hypotensive effect.

Ho Ya Ts'ao (*Ervatamia divaricat* (L.) Burk), an erect branchy shrub, rich in a milky sap, from the dogbane family. Native habitat of the plant is unknown, widely cultivated in the tropical zone. Bears alkaloids. Leaves and roots have proven to be effective hypotensives.

Hai Chou Chan Shan (*Clerodendron trichotomum* Thunb.), deciduous shrub or small tree up to 3 meters in height from the verberna family. China is its homeland; plant occurs from Hopeh to Fukien on the south and from Hupeh to Szechwan on the west. A decoction of the leaves and roots is used in popular medicine for headache, malaria, diarrhea, as a diuretic and as an insecticide. The plant greens in the form of a decoction, extract and tablets possess a strong hypotensive effect and are not inferior to reserpine in action. The chemical composition of the plant has been studied intensively; the glycoside picene ($C_{14}H_{18}O_7$) has been extracted as well as frideline $C_{30}H_{50}O$ and epifridelinol ($C_{30}H_{52}O$).

In the same area other species of *Clerodendron* are used in popular medicine: *C. bungei* Steud., *C. cyrtophyllum* Turca., *C. inerme* (L.) Gaertn., *C. Mendarinorum* Diels.

Hsi Lien (*Siegesbeckia orientalis* L.), an annual weed reaching a height of 1.5 meters from the family of the Compositae.

Used in popular medicine for malignant tumors, pulmonary paralysis, as a diuretic and sudorific. Studies of recent years have established that the herb of this plant may be used as a hypotensive. The preparation is put up in the form of tablets made from a dry extract.

A very closely related species, *Siegesbeckia pubescens* Makino, is used just like the preceding plant.

Chang Cheng Hua (*Vinca rosea* L. -- *Catharanthus roseus* (L.) G. Don -- *Lochnera rosea* (L.) Reichenb.) is a semishrub 30-50 centimeters in height from the dogbane family. Plant originated in tropical America but is now widely cultivated in the tropical zone of both hemispheres as a decorative plant. There are numerous varieties differing essentially in the color of the flowers. In recent years the tops of the plants have yielded alkaloids possessing a hypotensive effect. May be cultivated in the Russian subtropics as an annual.

In addition, in the treatment of hypertension, prescriptions in popular medicine frequently utilize plants possessing a tranquillizing, diuretic or laxative effect. Among the first are *Chrysanthemum morifolium* Romat (flowers), *Ligusticum sinense* Oliv. and *L. Wallichii* Fr. (roots), *Nelumbo nucifera* Gaertn. (seed germs), *Gastrodia elata* Blume (roots and stems), *Zizyphus spinosa* Hu (seeds), *Pachyrrhizus eros* L. (body of the fungus), *Angelica polymorpha* Maxim. (roots). As diuretics in hypertension the following plants are used: *Achyranthes bidentata* Blume (roots), *Cnicus segetum* (Bunge) Maxim. (herb), *Calendula arvensis* L. (flowers and herb), *Leonurus sibiricus* L. (herb), *Scutellaria baicalensis* Georgi (roots), *Brunella vulgaris* L. (herb), *Zea mays* L. (stigma), *Morus alba* L. (bark and leaves), *Allium sativum* L. f. *Pekinense* (bulb) and others. As laxatives the most frequently employed in prescriptions for hypertension are *Rheum officinale* Baill. (roots) and *Prunus japonica* Thunb. (seeds).

Plants Used in Treating Cardiovascular Diseases

Yang Chueh Su (*Strophanthus divaricatus* (Lour.) Hook et Arn.), a bare shrub with a milky sap, approximately 2 meters in height from the dogbane family. Grows on the mountain slopes in the southern provinces of China. Blooms in March-April, bears fruit in August-September. Seeds yield the glycosides (1.8%) dibaricoside ($C_{30}H_{46}O_6$) and cauloxide ($C_{30}H_{44}O_9$) which have a cardiac effect similar to strophanthin K. In recent years divaside preparations are being turned out which are the sum of the glycosides in the seeds; yield is approximately 1% on an average.

Chia Chu T'ao (*Nerium indicum* Mill. -- *N. odoratum* Soland.), evergreen shrub 5 meters in height and over of the dogbane family.

The species was introduced into China from Iran as a decorative plant long time ago. In Chinese medicine the leaves and bark are used as a cardiac drug. From the bark or leaves these cardiac glycosides are extracted: odoroside A ($C_{30}H_{46}O_7$), B ($C_{30}H_{46}O_7$), D ($C_{36}H_{56}O_{12}$), F ($C_{36}H_{56}O_{13}$), H ($C_{30}H_{46}O_8$), K ($C_{42}H_{66}O_{17}$), odorotrioside G ($C_{44}H_{68}O_{19}$), odorobioside K ($C_{42}H_{66}O_{17}$), oleandrin ($C_{32}H_{48}O_9$), and others having no effect on the heart. The species is very near to *Nerium oleander* L.; is cultivated in the USSR in Transcaucasia as a decorative plant.

Wan Nien Ch'ing (*Rhodea japonica* (Thunb.) Roth.), annual rhizome plant of the lily family. In China and Japan this species is a favorite decorative plant, existing in numerous varieties, differing in shape and color of the leaves. In popular medicine the rhizomes are used as a diuretic, tonic and cardiovascular drug. The rhizomes contain the glycosides: rhodexine A ($C_{29}H_{44}O_9$), rhodexine B ($C_{29}H_{44}O_9$), rhodexine C ($C_{35}H_{54}O_{14}$), rhodein ($C_{30}H_{44}O_{10}$) and rhodea-sapogenine ($C_{27}H_{44}O_4$).

In addition popular medicine frequently uses *Convallaria majalis* L. and *Polygonatum officinale* All. of the lily family, *Thevetia nerifolia* Juss. of the dogbane family, and *Scrophylaria Olchami* Oliv. of the figwort family as cardiac drugs.

Plants Which Are Sources of Steroid Compounds

In the Chinese People's Republic considerable attention is being given to finding steroid compounds among the plants. Particular attention has been directed toward studying plants of the genus *Dioscorea*. Numerous expeditions are being organized to areas where *Dioscorea* grows (provinces south of the Yangtse River, particularly Yunnan Province); the introduction and study of the chemical compositions of these plants has been given a wide scope. Among the 65 different species and varieties of *Dioscorea* growing in China, two of the most promising species have been selected -- *Dioscorea colletii* Hook f. and *D. panthaica* Prain. et Burk, which contain approximately 2% diosgenine in the rhizomes. At present China has available its own diosgenine, a valuable source material for producing cortisone and other hormone preparations.

Searches for sources for the production of steroid compounds will in the future be extended to the families Liliaceae, Amaryllidaceae, Apocynaceae and Solanaceae. Particular attention will be given to studying plants of the genus *Smilax*, of which up to 80 species are found in China.

Plants Which Are Sources of Essential Oils

Jih Leng P'ou Hou (*Mentha arvensis* L. var. *piperascens* Malinv.) is a cultivated plant, widely grown in China, probably

of hybrid origin. The plant is a source for high-grade mint oil and menthol which are exported. In the world market Chinese mint oil is second only to Brazilian in quality. In separate bred forms and varieties of Japanese mint the essential oil content is 1.8-2% while the menthol content is 86-92%.

Plants Used as Anodynes

Some alkaloid plants have found wide use in Chinese medicine as anodynes.

Fang Tse (*Stephania tetrandra* S. Moore), a dioecious, perennial herbaceous vine of the moonseed family. Grows in southeastern China (Chekiang, Kiangsi, Taiwan), reaching high up into the mountains. In Chinese popular medicine the turnip-shaped thickened roots of *Stephania* are used as anodynes, antipyretics, antiparasitics as well as in paralysis. The roots contain the alkaloids tetrandrine A, B and C in a total amount of 1.5%. The preparation, tetrandrine hydrochloride in ampules, tablets and dragees, is used for treating rheumatoid arthritis and is being studied as a hypotensive and anodyne. Of like interest are other species of *Stephania* which grow in China: *Stephania japonica* (Thunb.) Miers., *S. cepharantha* Hayata, *S. hernandifolia* (Willd.) Walp., *S. delavayi* Diels, *S. rotunda* Lour., *S. longa* Lour., *S. sinica* Diels.

Plants Used as Bactericides

Huang Yieh (*Phellodendron amurense* Rupr.) is a sturdy dioecious tree 10-15 meters in height of the rue family. Grows in northeastern China (formerly Manchuria) in Hopeh Province and in the Soviet Far East. The bark used widely in Chinese popular medicine as a gastrotonic, tonic, antipyretic and antiseptic; is a part of prescriptions for treating dysentery, nephritis, hypertension and other diseases. The bark is also a source for the production of the alkaloid berberine which is produced in large quantities in the Chinese People's Republic. Berberine preparations have become widely used in medicine for treating amebic dysentery and tuberculosis. In addition to the species indicated, *Phellodendron sachalinense* Sarg. and *Ph. japonicum* Maxim. are also used.

Huang Lien (*Coptis chinensis* Franch.) is a perennial herbaceous plant of the crowfoot family. The roots of the plant are widely used in Chinese medicine as an antiseptic, diuretic, gastrotonic, and in treating dysentery, diarrhea, inflammation of the intestines and hypertension. The roots contain many alkaloids (up to 6-9%), the most important being berberine. There is an annual harvest of approximately 900 tons of wild *Coptis* which is also a source for the production of berberine.

For the same purpose other species of *Coptis* are used: *C. anemonaefolia* Sieb. et Zucc. (7.5% alkaloids), *C. japonica* Makina (5% alkaloids) and *C. teeta* Wall. (8.2% alkaloids).

In addition the following are used in China as bactericides: *Allium sativum* L. (stems), *Eucalyptus globulus* L. (leaves), *Ginkgo biloba* L. (fruit), *Lonicera japonica* Thunb. (flowers) and the roots of *Rheum officinale* Baill. and *Scutellaria baicalensis* Georgi.

She Ch'uang (*Cnidium japonicum* Miq. -- *Selinum japonicum* Miq.) is a perennial herbaceous plant from the parsley family. In Chinese medicine the fruit of this plant is used as a tonic, a sexual roborant, and in headache and vertigo. Pharmaceutical establishments in the Chinese People's Republic are producing from the fruit of this plant a preparation for treating diseases of the female genitalia (*Trichomonas vaginalis*). It is a 15% extract from the seeds (liquid or in the form of a salve).

A related species *Cnidium monnieri* (L.) Cuss. which grows in the USSR (in the Far East and Eastern Siberia) can be used like the preceding plant.

In Chinese popular medicine many plants serve for treating gynecological diseases: *Eupatorium chinense* L. (leaves) and *Achyranthes bidentata* Blume (roots) of the Compositae, roots of *Angelica anomala* Lall. and *A. sinensis* (Oliv.) Diels of the parsley family, and *Salvia miltiorrhiza* Bunge of the mint family.

A further all-round study of drugs used in Chinese popular medicine and of the flora of China will make it possible to develop new drugs from plants.

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